DESCRIPTION

METHOD OF OPENNING TRAY OF OPTICAL DISC CHANGER AND METHOD OF REPRODUCING DATA RECORDED ON DISC

[Technical Field]

The present invention relates to an optical disc changer, and more particularly, to an improved method of opening a tray of an optical disc changer that enables loading of two discs simultaneously, and a method of reproducing data recorded on loaded optical discs.

[Background Art]

Compact disc changers, laser disc changers, compact disc graphic changers, and video compact disc changers have been developed and used as optical disc reproducing devices. Recently, digital video discs using motion picture experts group (MPEG) moving picture compression technology have been developed, and functions of the optical disc reproducing devices are improving.

In cases where an amount of data is large, such as in some movies, the data is recorded on two discs. However, since a user should change the disc, it is inconvenient to use the optical disc reproducing device. Therefore, an optical disc changer that includes a plurality of discs and selectively reproduces data recorded on a desired disc sequentially or at the discretion of the user is used.

For example, a roulette-type optical disc changer includes a tray, on which a plurality of discs can be loaded, and selectively reproduces one of the loaded discs with one optical pickup by rotating the tray.

A digital versatile disc (DVD) title generally includes two discs: disc A including a main feature and disc B including special features. However, in a conventional optical disc changer, disc are loaded one at a time, so loading a pair of discs (disc A and disc B) requires two loading processes. Also, when reproduction of data on disc A is completed, the user generally has to manipulate controls of the conventional optical disc changer to begin reproduction of data on disc B.

FIG. 1 is a perspective view illustrating the mechanical structure of a general optical disc changer. The optical disc changer shown in FIG. 1 includes a main body 110, a tray 150 installed and housed in the main body 110, a roulette 160, on which a plurality of optical discs are mounted, rotatably installed on the tray 15, an optical pickup 120 that reads data from one of the optical discs mounted on the roulette 160, a clamp 130

that clamps the optical disc, and a clamp supporting board 131 that is installed on an upper portion of the optical pickup 120 and supports the clamp 130.

FIG. 2 is a block diagram illustrating the circuit structure of the optical disc changer shown in FIG. 1. As shown in FIG. 2, the optical disc changer includes an optical pickup 202, a radio frequency (RF) signal and servo signal processor 204, a motor and servo driving unit 206, a key input unit 208, a microprocessor 210, a digital signal processor 212, a motion picture experts group (MPEG) decoder 214, an audio signal processor 216, and a video signal processor 218.

The optical pickup 202 generates an RF signal corresponding to a signal recorded on the disc, which is loaded on the tray, and outputs the RF signal to the RF signal and servo signal processor 204.

The RF signal and servo signal processor 204 amplifies the RF signal provided from the optical pickup 202, and provides the motor and servo driving unit 206 with a servo control signal corresponding to the RF signal.

The motor and servo driving unit 206 drives a roulette motor and a spindle motor (not shown) to rotate the roulette, and performs tracking and focusing operations by driving a tracking actuator and a focus actuator (not shown) of the optical pickup 202.

The digital signal processor 212 converts the amplified RF signal provided from the RF signal and servo signal processor 204 into a digital signal, performs an error detection and correction operation on the digital signal, and then outputs the digital signal to the MPEG decoder 214.

The MPEG decoder 214 decodes a digital audio signal and a digital video signal provided from the digital signal processor 212 using an MPEG compression format, and outputs the decoded audio signal to the audio signal processor 216 and the decoded video signal to the video signal processor 218.

The audio signal processor 216 and the video signal processor 218 process the decoded digital audio signal and digital video signal, respectively, provided from the MPEG decoder 214, and output the processed signals to one or more speakers and a display device (not shown).

The microprocessor 210 controls the optical disc changer to perform a disc reproduction operation and a tray opening/closing operation, in response to commands input through the key input unit 208.

In the optical disc changer shown in FIGS. 1 and 2, whether the disc is mounted should be determined while loading/unloading the disc. That is, when the disc tray is opened and closed, whether the disc is mounted on the disc mounting recess is

determined by rotating the roulette 160.

Also, information about the mounted disc, for example, table of content (TOC) information, is read out and stored. Then, the optical disc changer goes into a standby state, waiting for input from the key input unit 208.

The discrimination of the disc mounting recess and the disc recognizing process are performed by using a detection sensor. A plurality of recognition holes are formed around the disc mounting recess along a rotating trace of the tray in order to discriminate the disc mounting recess, and the detection sensor recognizes the disc mounting recess by determining the number of the recognition holes. Recognition of the disc mounting holes and control of disc mounting hole position are disclosed in Korean Laid-open Patent Nos. 2001-17235 (March 5, 2001), 1999-12003 (February 18, 1999), 1998-61647 (October 7, 1998), 1998-61664 (October 7, 1998), and 1998-69621 (October 26, 1998).

The detection sensor determines whether a disc is mounted and the size of a mounted disc. In more detail, a light receiving sensor is disposed at a position where a light signal would be shielded by a mounted disc, and attempts to detect the light signal to determine whether a disc is mounted and the size of the disc. The determination of whether a disc is mounted and the size of a mounted disc is disclosed in Korean Laid-open Patent Nos. 2002-49952 (June 26, 2002), 1998-61650 (October 7, 1998), and 1998-58828 (October 7, 1998).

The detection sensor for determining whether a disc is mounted and recognizing the disc mounting recess is generally installed around the optical pickup 202, that is, at a position corresponding to the innermost disc mounting recess of the disc changer.

When a command to open/close the tray is input, the roulette 160 rotates in one direction to position a disc mounting recess onto which a disc will be loaded or from which a disc will be unloaded at a loading/unloading position, and then the tray is opened. When a disc is loaded/unloaded and the tray is closed, the tray rotates in the opposite direction so that the disc mounting recess is positioned where the detection sensor is disposed. In above process, whether a disc is mounted on the disc mounting recess is determined by the detection sensor.

FIG. 3 is a plan view of a conventional optical disc changer with its tray open. In the conventional optical disc changer, since only one disc mounting recess is fully exposed when the tray is opened as shown in FIG. 3, discs must be loaded/unloaded one at a time. Thus, the loading operation should be performed twice in order to reproduce a title including two discs, and the user generally has to manipulate controls

to begin reproduction of data on disc B after reproduction of data recorded on disc A. In FIG. 3, a chucking point notifies the position on which the disc is reproduced.

[Brief Description of the Drawings]

FIG. 1 is a perspective view illustrating the mechanical structure of a general optical disc changer;

FIG. 2 is a block diagram illustrating the circuit structure of the general optical disc changer of FIG. 1;

FIG. 3 is a plan view of a conventional optical disc changer with its tray open;

FIG. 4 is a plan view of an optical disc changer with its tray open according to an optical disc changer tray opening method according to the present invention;

FIG. 5 is a flowchart illustrating an optical disc changer tray opening method according to a preferred embodiment of the present invention;

FIG. 6 is a block diagram illustrating an apparatus that performs an optical disc changer tray opening method according to the present invention; and

FIG. 7 is a flowchart illustrating a method of reproducing data on discs in an optical disc changer according to the present invention.

[Disclosure]

[Technical problem]

The present invention provides an optical disc changer tray opening method that enables loading of two discs simultaneously.

The present invention also provides a method of reproducing data recorded on two discs loaded on a tray of an optical disc changer by an optical disc changer tray opening method according to the present invention.

[Technical solution]

According to the present invention, two discs mounting recesses are exposed so that discs can be mounted on them simultaneously when the tray is opened.

[Advantageous Effect]

According to the optical disc changer tray opening method of the present invention, two discs can be mounted simultaneously when the tray is open, thereby enhancing convenience for the user.

Also, according to the method of reproducing data on a disc in the optical disc changer of the present invention, a title including two discs can be reproduced more conveniently.

[Best mode]

According to an aspect of the present invention, there is provided a method of

opening a tray of an optical disc changer that includes a plurality of disc mounting recesses, on each of which a disc can be mounted, the method including: if a tray open command for mounting two discs simultaneously is input by a user, moving two disc mounting recesses to a position where they will both be exposed so that discs can be mounted on them simultaneously when the tray is opened; and opening the tray.

According to another aspect of the present invention, there is provided a method of reproducing data from discs in an optical disc changer that is suitable for a tray open mode that enables two discs to be mounted simultaneously, the method including: determining whether discs are mounted on pre-selected disc mounting recesses; reproducing a first disc having higher priority when it is determined that discs are mounted on the selected two disc mounting recesses; and reproducing a second disc when reproduction of the first disc is competed.

[Mode for invention]

FIG. 4 is a plan view of an optical disc changer with its tray open according to an optical disc changer tray opening method of the present invention. As shown in FIG. 4, since two disc mounting recesses are fully exposed when the tray is opened, two discs can be mounted simultaneously.

FIG. 5 is a flow chart illustrating an optical disc changer tray opening method according to a preferred embodiment of the present invention.

Here, a tray open mode that mounts only one disc at a time, as in the conventional art, will be referred to as an A-type open mode, and a tray open mode that enables mounting of two discs simultaneously, as in the present invention, is referred to as a B-type open mode. Commands for performing the modes will be referred to as an A-type open command and a B-type open command.

Referring to FIG. 5, a user inputs a tray open command (S502).

When the tray open command is input by the user, it is determined whether the open command is the A-type open command or the B-type open command (S504).

If the command is the A-type open command, the tray is opened according to the conventional method (S506). Thus, only one disc can be mounted when the tray is opened.

If the command is the B-type open command, the optical disc changer exposes two disc mounting recesses so that two discs can be mounted simultaneously when the tray is opened.

In more detail, if the command is the B-type open command, the optical disc changer searches for two consecutive, empty disc mounting recesses (S508).

When two successive, empty disc mounting recesses are found, the two disc mounting recesses are selected and numbers of the selected disc mounting recesses are recorded (S510).

Next, the two selected disc mounting recesses are moved to a position which is exposed when the tray is opened (loading position) (S512). For example, in a roulette-type optical disc changer, the roulette is rotated until the two disc mounting recesses selected in step 510 are exposed when the tray is opened. That is, the roulette is rotated so that a center between the two disc mounting recesses selected in step 510 is located at a center portion of an area to be exposed when the tray is opened.

In more detail, a distance between the center of the area to be exposed and a detection sensor is determined by the optical disc changer. The optical disc changer detects numbers of the disc mounting recesses passing through the detection sensor while rotating the roulette. The roulette is further rotated as much as the distance between the center of the area to be exposed and the detection sensor, after the first of the two disc mounting recesses passes through the detection sensor.

Next, the tray is opened (S514). When the roulette rotates so that the center of the two disc mounting recesses is located at the center of the area to be exposed, the rotation is halted and the tray is opened so that the user can load discs.

If no successive, empty recesses are found in step 508, two successive disc mounting recesses are selected and numbers of the recesses are recorded (S516). Then, steps S512 and S514 are performed so that the user can unload previously loaded discs and load new discs when the tray is open.

The loading positions of the discs and the reproducing order are closely related. In more detail, it is desirable that the second disc (disc B) is mounted on the disc mounting recess that is detected earlier by the detection sensor due to the rotation of the roulette, and the first disc (disc A) is mounted on the disc mounting recess that is detected later. Thus, the first disc (disc A) is detected and reproduced first.

It is desirable that symbols or numerals representing the loading order of the discs are printed on a predetermined part of the tray.

FIG. 6 is a block diagram illustrating an apparatus that performs the optical disc changer tray opening method according to the present invention. The apparatus includes a roulette 602 having a plurality of disc mounting recesses h1 through h5, a roulette motor 604 that rotates the roulette 602, a detection sensor 606 that recognizes the disc mounting recesses h1 through h5 and determines whether a disc is mounted

on each of them, a key input unit 608 through which commands are input by a user, and a microprocessor 610 that controls the roulette motor 604 according to tray open/close commands input through the key input unit 608.

When the user inputs the B-type open command through the key input unit 608, the microprocessor 610 controls the roulette motor 604 in response to the command so that two disc mounting recesses are moved to loading/unloading position. Here, it is desirable that the key input unit 608 comprises a separate key for the B-type open command. Alternatively, the B-type open command can be input by operating the same key used to input the A-type open command but in a different manner.

When the disc is loaded/unloaded and the tray is closed, the microprocessor 610 controls the roulette motor 604 to rotate the roulette 602 in order to determine whether discs are mounted on the disc mounting recesses. That is, when the B-type open command is applied, it is determined whether discs are mounted on the selected two disc mounting recesses.

In above process, the detection sensor 606 recognizes the disc mounting recesses that pass by when the roulette 602 rotates, and determines whether discs are mounted on the corresponding disc mounting recesses. The detection result of the detection sensor 606 is provided to the microprocessor 610.

FIG. 7 is a flow chart illustrating a method of reproducing data on discs in an optical disc changer according to the present invention. Here, it is assumed that two discs (disc A and disc B) are mounted by the B-type open command, and priority is set with respect to the discs. That is, it is assumed that disc A has priority.

The user applies a tray close command (S702).

When the tray close command is received, it is determined whether discs are mounted on the disc mounting recesses which are selected when the B-type open command is applied (S704).

If discs are mounted on the two selected disc mounting recesses, the first disc (disc A) having higher priority is reproduced (S706).

When the reproduction of disc A is completed, the next disc (disc B) is reproduced automatically (S708).

If it is determined that only one of the two disc mounting recesses has a disc mounted on it in step 704, the mounted disc is reproduced (S710).